



Cleveland Clinic Heart Center

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Treating the Heart, Blood Vessels and Circulation

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Sudden Cardiac Death (SCD)

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What is sudden cardiac death (SCD)?

- Sudden cardiac death is a sudden, unexpected death caused by loss of heart function.
- It is the largest cause of natural death in the United States, causing about 250,000 adult deaths each year.

What causes sudden cardiac death?

Most sudden cardiac deaths are caused by arrhythmias (abnormal heart rhythms). The most common life-threatening arrhythmia is ventricular fibrillation, an erratic, disorganized firing of impulses from the ventricles. When this occurs, the heart is unable to pump blood, and death will occur within minutes, if left untreated.

Certain traits put one at increased risk for SCD:

- Coronary artery disease (80 percent of SCD is linked to coronary artery disease)
- Ventricular tachycardia (abnormally rapid heart rhythm) or ventricular fibrillation (fluttering or quivering of the lower chambers of the heart) after a heart attack
- Those with certain risk factors for coronary artery disease:
 - cigarette smoking
 - family history
 - high cholesterol
 - high blood pressure with heart enlargement
- History of heart defects
- History of syncope (fainting)
- Heart failure with ejection fraction less than 30 percent
- Hypertrophic cardiomyopathy (an increased growth in thickness of the wall of the left ventricle)
- Dilated cardiomyopathy (an abnormally enlarged heart) may be the cause of SCD in about 10 percent of cases
- History of certain abnormal heart rhythms:
 - Long QT syndrome
 - Ventricular tachycardia

EXHIBIT H

- Ventricular fibrillation
- Wolff Parkinson white syndrome
- Extremely slow heart rates or heart block
- First 6 to 18 months after a coronary event (heart attack)
- Obesity
- Diabetes

Statistics:

- 80 percent of SCD is associated with coronary artery disease.
- About half of deaths from coronary heart disease are sudden.
- About 250,000 sudden cardiac deaths occur each year among adults in the United States.
- SCD occurs mostly in adults (mid 30's to 40's).
- SCD affects men twice as much as women.
- SCD occurs in only 1 to 2 per 100,000 children per year.

Is sudden cardiac death a heart attack?

Sudden cardiac death is **not** a heart attack. A heart attack occurs due to blockage in one or more of the coronary arteries that feed the heart muscle, resulting in lack of blood flow to the heart muscle. The heart becomes damaged.

In contrast, during sudden cardiac death, the electrical system to the heart suddenly becomes irregular. The ventricles may flutter or quiver (ventricular fibrillation), and blood is not delivered to the body. Of greatest concern in the first few minutes is that blood flow to the brain will be reduced so drastically, a person will lose consciousness. Death follows unless emergency treatment is begun immediately.

Emergency treatment for sudden cardiac death

Sudden cardiac death can be treated and reversed, but emergency action must take place almost immediately. Survival can be as high as 90 percent if treatment is initiated within the first minutes after SCD. The rate decrease by about 10 percent each minute longer. Those who survive have a good long-term outlook.

The American Heart Association promotes using the four steps, called "**the chain of survival**."

1. **Early Access to Care.** Quick contact with emergency care is essential. **If someone experiences SCD, call 911 (in most communities) or your local emergency number immediately.**
2. **Early Cardiopulmonary Resuscitation (CPR).** If performed properly, CPR can help save a life, as the procedure keeps blood and oxygen circulating through the body until emergency medical help arrives.
3. **Early Defibrillation.** In most adults, sudden cardiac death is related to ventricular fibrillation. Quick defibrillation (delivery of an electrical shock) is necessary to return the heart rhythm to a normal heartbeat. The shorter the time until defibrillation, the greater the chance the person will survive. Emergency squads use portable defibrillators and frequently there are public access defibrillators (AEDs) in public locations that are intended to be available for use by citizens who observed the cardiac arrest. (see below for more information).
4. **Early Advanced Care.** After successful defibrillation, most patients require hospital care to treat and prevent future events.

These 4 steps can increase survival as high as 90 percent if initiated within the first minutes after SCD. Survival decreases by about 10 percent each minute longer. Those who survive have a good

long-term outlook.

To learn CPR

Learning CPR is the largest gift you can give your family and friends. CPR is easy for most adults and teens to learn. It is a technique designed to temporarily circulate oxygenated blood through the body of a person whose heart has stopped. It involves:

- Assessing the airway
- Breathing for the person
- Determining if the person is pulseless and applying pressure to the chest to circulate blood



CPR:

call 911

A - airway

B - breathing

C - circulation
(chest compressions)

To learn more about CPR:

- contact your local American Heart Association
- call the national American Heart Association at 1-800-AHA-USA1, or
- go to the American Heart Association Web site at www.americanheart.org/Heart/CPR/cpr_broch.html.*
- Home training programs are available through a program called CPR prompt. See www.compliant.com for more information.*

More about Automatic External Defibrillators

Automatic external defibrillators (AEDs) are defibrillators with computers that are able to recognize ventricular fibrillation (VF), advise the operator that a shock is needed, and deliver the shock. AEDs are designed to be used by a wide range of personnel such as fire department personnel, police officers, lifeguards, flight attendants, security guards, teachers, and even family members of high-risk persons. The goal is to provide access defibrillation when needed as quickly as possible. CPR along with AEDs can dramatically increase survival rates for sudden cardiac death.

Can SCD be prevented?

If you have any of the risk factors for SCD, it is important that you speak with your doctor about possible steps to reduce the risk of SCD. Sudden cardiac death (SCD) events are prevented by:

- Evaluation
- Prevention Strategies

■ Evaluation

Your doctor will want to evaluate you if you have risk factors for SCD or have had a SCD event. Evaluation includes:

- History — Information by the patient and those who have witnessed the patient's SCD event (if the patient has had one) is very helpful to prevent future risk. The doctor will ask about:
 - Prior history of SCD
 - Family history of SCD, Long QT syndrome, or cardiomyopathies
 - Use of medications that may prolong the QT interval
 - Symptoms: syncope (fainting, dizziness), dyspnea (shortness of breath), chest pain,

- palpitations (fluttering in chest)
- History of any of the risk factors for SCD mentioned above
- Diagnostic tests — these tests help determine what caused the SCD event: ECG, ejection fraction, ambulatory monitoring, echocardiography, cardiac catheterization, electrophysiology study

■ Prevention

Primary prevention – The goal of primary prevention is to decrease the risk of sudden cardiac death in those who have never had an event. Treatment is aimed at identifying those at high risk and treating the risk factors. If you have any of the risk factors listed above, it is important to speak to your doctor about possible steps to reduce your risk.

● Medications

To help reduce the risk of SCD occurring, doctors may prescribe medications to patients who have had heart attacks, heart failure, or those with specific arrhythmias (irregular heart rhythms). If your doctor prescribed a medication, he or she will tell you more about why you are taking it.

It is important to know:

- the names of your medications
- what they are for
- how often and at what times to take them

Check the **drug search** to find out more about your medications. If you have questions be sure to ask your doctor or pharmacist.



● Risk factor modification

If you have coronary artery disease, and even if you do not, there are certain lifestyle changes that can be made to reduce the risk of SCD. These include reducing high blood pressure and cholesterol, quitting smoking, losing weight, exercising regularly, and eating a healthy diet. Patients and families should know the signs and symptoms for coronary artery disease and the steps to take if symptoms occur. If you have any questions about risk factors for heart disease or how to make these changes, ask your doctor for advice.

● Implantable cardioverter-defibrillator (ICD)

For patients whose risk factors put them at great risk for SCD (history of ventricular tachycardia, post heart attack with poor left ventricular function (ejection fraction), or those with specific genetic heart defects), an ICD may be inserted as a primary prevention treatment. The ICD is a small machine, similar to a pacemaker, that is designed to constantly monitor the heart rhythm. When it detects a very fast or slow abnormal heart rhythm, it delivers energy to the heart muscle to cause the heart to beat in a normal rhythm again. The ICD also records the data of each abnormal heartbeat which can be viewed by the doctor through a third part of the system kept at the hospital.

● Interventional procedures or coronary artery bypass surgery

For patients with known coronary artery disease, a procedure such as angioplasty or bypass surgery may be needed to improve blood flow to the heart muscle and prevent future coronary events.

Secondary prevention – Once someone has survived sudden cardiac death, the goal is to decrease the risk of future events:

● Medications

Antiarrhythmic medications are given to prevent future ventricular tachycardia or fibrillation. Because everyone is different, it may take trials of several medications and doses to find the one that works best for you.

- **Risk factor modification**

Those at risk for cardiac events should target risk factors and treat them through lifestyle changes and medications. Patients and families should know the signs and symptoms for coronary artery disease and the steps to take if symptoms occur.

- **Implantable cardioverter-defibrillator (ICD)**

- **Interventional procedures or coronary artery bypass surgery**

For those who have significant coronary artery disease, decreased blood flow to the heart can cause areas of ischemia (lack of oxygen-rich blood flow to the heart muscle). These areas of heart muscle can be more irritable, causing life-threatening heart rhythms. Bypass surgery and/or angioplasty returns blood flow to the heart muscle. These procedures, combined with an ICD, can be a life-saving treatment.

- **LV reconstruction surgery combined with ablation**

When a heart attack occurs in the left ventricle (left lower pumping chamber of the heart), a scar forms. The scarred tissue may make the heart more prone to ventricular tachycardia. The electrophysiologist (doctor specializing in electrical disorders of the heart) can determine the exact area causing the arrhythmia. The electrophysiologist, working with your surgeon, may combine ablation (the use of high-energy electrical energy to "disconnect" abnormal electrical pathways within the heart) with surgical removal of the infarcted (dead) area of heart tissue.

For more information about treatment for ventricular tachycardia or fibrillation, see:

- [Abnormal Heart Rhythms](#)
- [Long QT Syndrome](#)
- [WPW](#)

A note about SCD and athletes

One cannot discuss SCD without touching upon SCD and athletes. Although SCD occurs rarely in athletes, when it does happen, it often affects us with shock and disbelief. How can this happen to someone who is so "healthy?"

- **Cause:** Most cases of SCD are related to undetected heart disease. In the younger population, it is often due to congenital heart defects, while in older athletes (35 years and older), the cause is more often related to coronary artery disease.
- **Prevalence:** SCD in athletes occurs rarely; however the media often makes it seem like it happens more often. It is estimated that in the younger population, most SCD occurs while playing team sports, in about one in 100,000 to one in 300,000 athletes, and more often in males. In older athletes, it occurs more often during running or jogging and in approximately one in 15,000 joggers and one in 50,000 marathon runners.
- **Screening:** The American Heart Association recommends cardiovascular screening for high school and collegiate athletes and should include:
 - Complete and careful personal and family history
 - Physical exam

Screening should be repeated every two years with a history obtained every year.

Men older than 40 years and women older than 50 years should also have an:

- Exercise stress test
- Education about cardiac risk factors and symptoms

If heart problems are identified or suspected, the athlete should be referred to a cardiologist for further evaluation and treatment guidelines prior to participating in sports.

How to find a doctor if you have Sudden

Cardiac Death

Adult : [Click here to find a Cleveland Clinic Heart Center Cardiologist who treats abnormal heart rhythms](#)

Pediatrics: [Dr. Richard Sterba](#)

For more information on SCD:

- FastHeartBeat - <http://www.fastheartbeat.com>
- For Ohio Residents, visit FastHeartBeat-Ohio at <http://www.fastheartbeat-ohio.org>

FastHeartBeat-Ohio is a consortium of local hospitals, physicians, organizations and healthcare companies designed to raise the awareness of sudden cardiac death (SCD). On this site, you will find news stories, FAQs, and information about SCD and its treatment.

Sources:

[Click here to find related publications written by Heart Center physicians](#)

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What to do if you witness sudden cardiac death

Dial your local emergency personnel immediately (9-1-1 in most areas) and initiate CPR. If done properly, CPR can save a person's life.

If there is a public access defibrillator (AED) available, the best chance of survival includes defibrillation with that device.

CPR plus defibrillation = rescue.

After successful defibrillation, most people require hospital care.

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